

Three-Phase Equilibrium in the n-Pentane + Water System

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The investigation of phase and volumetric behaviour of solutions at boosted temperatures and pressures gives information on interactions of homogeneous and diverse molecules of a solution which is of major practical concern for processes of chemical technology, oil-extracting and oil refining industry. One of the least learnt classes of solutions is of water with non polar builders. We made an experimental investigation of PVTx-properties of the system water – n-pentane. Under the usual requirements, water and pentane are not diluted in each other, but the selection of temperature, pressure and composition can give complete miscibility. The measurements are held on isochores on a piezometer of constant volume over a temperature range from 300 K up to 680 K, pressures up to 60 MPa for five concentrations: 3; 4; 5; 6; and 6.38 % of mass water. For each composition the 10 - 11 isochores are taken encompassing densities from 0.063 g/cm³ up to 0.51 g/cm³. On isochores in a P - T diagram, the inflections relevant to the fluid-fluid phase transition and fractures relevant to the fluid-gas phase transition are scored. Joining inflection points and fractures of all isochores, the lines of phase equilibrium for fluid - fluid and fluid - gas are gained. The critical parameters of these lines with a slight water content in a solution come nearer to each other and at a concentration of 6.38 % of mass water with one blanket point of tangency. This point corresponds to the upper end critical point. At attachment in system of water the general pressure grows, the water content in a gas phase is incremented and the part of water is diluted in pentane. The pressure in the system is incremented prior to the beginning formation of the second liquid phase and the system transfers from two-phase to three-phase. The area of equilibrium between hydrocarbon fluids and the gas phase is restricted to a curve of three-phase equilibrium, the line of lower locus of critical points and the curve of a vapor pressure of clean pentane. The temperature of three-phase equilibrium is lower than the boiling temperature of clean components at pressures equal to the pressure at the three-phase equilibrium. On P - T diagram the of three-phase equilibrium range is a curve, moving from the upper end critical point towards the field of more lower temperature and pressures.